



**MILITARY DATA SHEET**

**MN54AC174-X REV 1A0**

Original Creation Date: 06/28/96  
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**Hex D Flip - Flop With Master Reset**

**General Description**

The AC174 is a high-speed hex D flip-flop. The device is used primarily as a 6-bit edge-triggered storage register. The information on the D inputs is transferred to storage during the LOW-to-HIGH clock transition. The device has a Master Reset to simultaneously clear all flip-flops.

**Industry Part Number**

54AC174

**NS Part Numbers**

54AC174DMQB  
 54AC174FMQB  
 54AC174LMQB

**Prime Die**

Z174

**Processing**

MIL-STD-883, Method 5004

**Quality Conformance Inspection**

MIL-STD-883, Method 5005

**Subgrp Description**

**Temp ( °C)**

1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

**Features**

- Icc reduced by 50%
- Outputs source/sink 24 mA
- Standard Military Drawing (SMD)
- AC174: 5962-87626

**(Absolute Maximum Ratings)**

(Note 1)

Supply Voltage (Vcc)	-0.5V to +7.0V
DC Input Diode Current (Iik)	
Vi = -0.5V	-20 mA
Vi = Vcc +0.5V	+20 mA
DC Input Voltage (Vi)	-0.5V to Vcc +0.5V
DC Output Diode Current (Iok)	
Vo = -0.5V	-20 mA
Vo = Vcc +0.5V	+20 mA
DC Output Voltage (Vo)	-0.5V to Vcc +0.5V
DC Output Source or Sink Current (Io)	±50 mA
DC Vcc or Ground Current per Output Pin (Icc or Ignd)	±50 mA
Storage Temperature (Tstg)	-65 C to +150 C
Junction Temperature (Tj)	175 C

Note 1: Absolute maximum ratings are those values beyond which damage to the device may occur. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. National does not recommend operation of FACT™ circuits outside databook specifications.

**Recommended Operating Conditions**

Supply Voltage (Vcc)	2.0V to 6.0V
Input Voltage (Vi)	0V to Vcc
Output Voltage (Vo)	0V to Vcc
Operating Temperature (Ta)	-55 C to +125 C
Minimum Input Edge Rate (Delta V/Delta t)	
AC Devices	
Vin from 30% to 70% of Vcc	
Vcc @ 3.0V, 4.5V, 5.5V	125 mV/ns

## Electrical Characteristics

### DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)  
 DC: VCC 3.0V to 5.5V, Temperature Range -55 C to 125 C. NOTE: -55C TEMPERATURE, SUBGROUP 3 IS GUARANTEED  
 BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IIH	High level input Current	VCC=5.5V, VM=5.5V	1, 2	INPUT		0.1	uA	1
			1, 2	INPUT		1.0	uA	2, 3
IIL	Input leakage current	VCC=5.5V, VM=0.0V	1, 2	INPUT		-0.1	uA	1
			1, 2	INPUT		-1.0	uA	2, 3
VOL	Low level output Voltage	VCC=3.0V, VINH=3.0V, VIL=0.9V, IOL=12.0mA	1, 2	OUTPUT		.36	V	1
			1, 2	OUTPUT		.50	V	2, 3
		VCC=3.0V, VINH=3.0V, VIL=0.9V, IOL=50.0uA	1, 2	OUTPUT		.10	V	1, 2, 3
			1, 2	OUTPUT		.36	V	1
		VCC=4.5V, VINH=4.5V, VIL=1.35V, IOL=24.0mA	1, 2	OUTPUT		.36	V	1
			1, 2	OUTPUT		.50	V	2, 3
		VCC=4.5V, VINH=4.5V, VIL=1.35V, IOL=50.0uA	1, 2	OUTPUT		.10	V	1, 2
			1, 2	OUTPUT		.36	V	1
VCC=5.5V, VINH=5.5V, VIL=1.65V, IOL=24.0mA	1, 2	OUTPUT		.36	V	1		
	1, 2	OUTPUT		.50	V	2, 3		
VCC=5.5V, VINH=5.5V, VIL=1.65V, IOL=50.0uA	1, 2	OUTPUT		.10	V	1, 2, 3		
	1, 2	OUTPUT		.36	V	1		
VIOH	Dynamic Output Current LOW	VCC=5.5V, VINH=5.5V, VIH=3.85V, VIL=1.65V, IOL=50.0mA	1, 2, 5	OUTPUT		1.65	V	1, 2, 3
VOH	High level output Voltage	VCC=3.0V, VIH=2.1V, IOH=-12.0mA	1, 2	OUTPUT	2.56		V	1
			1, 2	OUTPUT	2.40		V	2, 3
		VCC=4.5V, VIH=3.15V, IOH=-24.0mA	1, 2	OUTPUT	3.86		V	1
			1, 2	OUTPUT	3.70		V	2, 3
		VCC=5.5V, VIH=3.85V, IOH=-24.0mA	1, 2	OUTPUT	4.86		V	1
			1, 2	OUTPUT	4.70		V	2, 3
		VCC=3.0V, VIH=2.1V, VINL=0.0V, IOH=-50.0uA	1, 2	OUTPUT	2.90		V	1, 2, 3
			1, 2	OUTPUT	4.40		V	1, 2, 3
VCC=4.5V, VIH=3.15V, VINL=0.0V, IOH=-50.0uA	1, 2	OUTPUT	4.40		V	1, 2, 3		
	1, 2	OUTPUT	5.40		V	1, 2		
VIOH	Dynamic Output Current HIGH	VCC=5.5V, VINH=5.5V, VIH=3.85V, IOH=-50.0mA	1, 2, 5	OUTPUT	3.85		V	1, 2, 3
ICCH	Supply current	VCC=5.5V, VINH=5.5V	1, 2	VCC		4	uA	1
			1, 2	VCC		80	uA	2, 3

## Electrical Characteristics

### DC PARAMETERS (Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)  
 DC: VCC 3.0V to 5.5V, Temperature Range -55 C to 125 C. NOTE: -55C TEMPERATURE, SUBGROUP 3 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
ICCL	Supply current	VCC=5.5V, VINH=5.5V, VINL=0.0V	1, 2	VCC		4	uA	1
			1, 2	VCC		80	uA	2, 3

### AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)  
 AC: CL=50pF, RL=500 OHMS, TRISE=3.0ns, TFALL=3.0ns, Temp Range: -55C to 125C. NOTE: -55C TEMPERATURE, SUBGROUP 11 IS GUARANTEED BUT NOT TESTED.

tpLH(1)	Propagation Delay	VCC=4.5V	3, 4, 7	CP to QN	1.5	8.5	ns	9
			3, 4, 7	CP to QN	1.5	10.5	ns	10, 11
tpHL(1)	Propagation Delay	VCC=4.5V	3, 4, 7	CP to QN	1.5	8.0	ns	9
			3, 4, 7	CP to QN	1.5	10.0	ns	10, 11
tpHL(2)	Propagation Delay	VCC=4.5V	3, 4, 7	$\overline{MR}$ to Qn	1.5	9.0	ns	9
			3, 4, 7	$\overline{MR}$ to Qn	1.5	11.0	ns	10, 11
ts(H/L)(1)	Setup Time HIGH or LOW	VCC=4.5V	6	Dn to CP	5.0		ns	9
			6	Dn to CP	5.5		ns	10, 11
th(H/L)(1)	Hold Time HIGH or LOW	VCC=4.5V	6	Dn to CP	3.0		ns	9, 10, 11
tw(H/L)(1)	CP Pulse Width	VCC=4.5V	6	CP Pulse Width	5.0		ns	9, 10, 11
tw(L)(2)	Pulse Width	VCC=4.5V	6	$\overline{MR}$ Pulse Width	5.0		ns	9, 10, 11
trec(1)	Recovery Time	VCC=4.5V	6	$\overline{MR}$ to CP	2.0		ns	9, 10, 11
FMAX(1)	Maximum Clock Frequency	VCC=4.5V	6		95		MHz	9
			6		90		MHz	10, 11
tpLH(3)	Propagation Delay	VCC=3.0V	3, 4	CP to Qn	1.0	11.5	ns	9
			3, 4	CP to Qn	1.0	14.0	ns	10, 11

## Electrical Characteristics

### AC PARAMETERS (Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)  
 AC: CL=50pf, RL=500 OHMS, TRISE=3.0ns, TFALL=3.0ns, Temp Range: -55C to 125C. NOTE: -55C TEMPERATURE,  
 SUBGROUP 11 IS GUARANTEED BUT NOT TESTED.

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpHL(3)	Propagation Delay	VCC=3.0V	3, 4	CP to Qn	1.0	11.0	ns	9
			3, 4	CP to Qn	1.0	13.0	ns	10, 11
tpHL(4)	Propagation Delay	VCC=3.0V	3, 4	$\overline{MR}$ to Qn	1.0	11.5	ns	9
			3, 4	$\overline{MR}$ to Qn	1.0	13.5	ns	10, 11
ts(H/L)(2)	Setup Time HIGH or LOW	VCC=3.0V	6	Dn to CP	6.5		ns	9
			6	Dn to CP	7.5		ns	10, 11
th(H/L)(2)	Hold Time HIGH or LOW	VCC=3.0V	6	Dn to CP	3.0		ns	9, 10, 11
tw(H/L)(2)	Pulse Width	VCC=3.0V	6	CP Pulse Width	5.5		ns	9
			6	CP Pulse Width	7.0		ns	10, 11
tw(L)(3)	Pulse Width	VCC=3.0V	6	$\overline{MR}$ Pulse Width	5.5		ns	9
			6	$\overline{MR}$ Pulse Width	7.0		ns	10, 11
trec(2)	Recovery Time	VCC=3.0V	6	$\overline{MR}$ to CP	2.5		ns	9
			6	$\overline{MR}$ to CP	3.0		ns	10, 11
FMAX(2)	Maximum Clock Frequency	VCC=3.0V	6		90		MHz	9
			6		65		MHz	10, 11

Note 1: SCREEN TESTED 100% ON EACH DEVICE AT +25C & +125C TEMPERATURE, SUBGROUPS 1, 2, 7, & 8.

Note 2: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C & +125C TEMPERATURE, SUBGROUPS A1, 2, 7, & 8.

Note 3: SCREEN TESTED 100% ON EACH DEVICE AT +25C TEMPERATURE ONLY, SUBGROUP A9.

Note 4: SAMPLE TESTED (METHOD 5005, TABLE 1) ON EACH MFG. LOT AT +25C & +125C TEMPERATURE, SUBGROUPS A9 & 10.

Note 5: TRANSMISSION LINE DRIVING TEST, GUARDBAND LIMITS SET FOR +25C, 2 MSEC DURATION MAX.

Note 6: GUARANTEED BUT NOT TESTED. (DESIGN CHARACTERIZATION)

Note 7: +25C & +125C MIN LIMITS GUARANTEED FOR 5.5V BY GUARDBANDING 4.5V MIN. LIMITS.